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Integrated Turbine-Compressor Provides Air Flow for Cooling

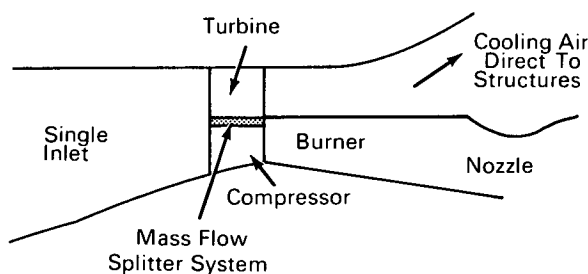


Diagram of Turbo-Cooler Design

A novel method has been proposed which provides cooling air to surrounding structures by means of a modified supersonic turbine cycle. The compressor cycle and the turbine cycle, shown in the figure, are placed in the same wheel structure and fed by the same inlet. The ducted air flow from the turbine is utilized as the cold air source. This innovation may be useful in commercial transportation applications that utilize ducted fan or gas turbine propulsion systems. Other potential areas of application could include the use of the turbine as an air source for industrial drying of large surfaces such as paper, plastics, textiles and ceramic products. The same method of providing air could be used for annealing of nonferrous sheet metals and tempering of large sheets of glass.

The concept of using a supersonic turbine to produce cooling air at low stagnation temperatures is well known. In previous methods the shaft power, produced by the turbine, was absorbed by a separate compressor located downstream from the turbine; this configuration required separate inlets for the turbine. In order to process the cooling air through the structure, a complex piping system was required to minimize interference with the supporting structure connecting the turbine and compressor; this

additional plumbing introduces flow losses into the system.

One of the outstanding advantages afforded by this system is the service of both the turbine and compressor by a single air inlet. The inlet design can be employed to furnish the rotating machinery with appropriate initial conditions. The reduced plumbing produces no interference with the rotating parts and the cooling air can be directly issued to the structure. Correct balance of the air flow through the system is assured by a splitter system. The placement of the turbine and compressor on the same wheel eliminates the connecting shaft. In addition to the mechanical simplification, this arrangement also assists in matching the turbine work output to the work input required by the compressor.

Note:

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Headquarters
National Aeronautics
and Space Administration
Washington, D.C. 20546
Reference: B70-10295

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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